

Open Hardware for CERN's Accelerator Control Systems

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The accelerator control systems at CERN will be renovated and many electronics modules like analog and digital I/O, level converters and repeaters, serial links and timing modules are being redesigned.

The new developments are based on VITA and PCI-SIG standards such as FMC, PCI Express and VME64x. The Wishbone specification is used as SOC bus.

To attract partners, the projects are developed in an 'Open' fashion. Within this Open Hardware project new ways of working with industry are being tested and it will be shown that industry can be involved at all stages, from design to production and support.

Summary 500 words

The accelerator control systems at CERN will be renovated and many electronics modules will be redesigned as the modules they will replace cannot be bought anymore or use obsolete components.

The modules used in the control systems are diverse: analog and digital I/O, level converters and repeaters, serial links and timing modules. Overall around 120 modules are supported that are used in systems such as beam instrumentation, cryogenics and power converters. Only a small percentage of the currently used modules are commercially available, while most of them had been specifically designed at CERN.

The new developments are based on VITA and PCI-SIG standards such as FMC (FPGA Mezzanine Card), PCI Express and VME64x using transition modules. As system-on-chip interconnect, the public domain Wishbone specification is used.

For the renovation, it is considered imperative to have for each board access to the full hardware design and its firmware so that problems could quickly be resolved by CERN engineers or its collaborators.

To attract other partners, that are not necessarily part of the existing networks of particle physics, the new projects are developed in a fully 'Open' fashion. This allows for strong collaborations that will result in better and reusable designs.

Within this Open Hardware project new ways of working with industry are being tested with the aim to prove that there is no contradiction between commercial off-the-shelf products and openness and that industry can be involved at all stages, from design to production and support.

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